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ESSENTIAL OILS AND ESSENCES.

The Chemistry of Essential Oils and Artificial Perfumes. By Ernest J. Parry. Second edition, revised and enlarged. Pp. viii+546. (London: Scott, Greenwood and Son, 1908.) Price 12*s.* 6*d.* net.

THE chemistry of the essential oils is one of the most interesting, and at the same time one of the most complicated, sections of plant chemistry. To begin with, the true function of an essential oil in the economy and life-history of a plant is by no means clear. It might at first sight be thought to be connected with the reproductive agencies of the plant, and possibly as regards the flower this may be the case; a fragrant smell in the flower may be the means of attracting the insects which carry the fecundating pollen. But that the attraction of insects is not the sole function of an odoriferous oil must be obvious from the circumstance that many essential oils, as in the conifers, are to be met with in practically all parts of the plant; some are found in the fruits, and a few even in the roots. At the same time, there is much evidence to show that the occurrence of an essential oil in a plant is frequently directly related to processes which ensure the continuance of the species. The amount increases with the growth of inflorescence and decreases after the flowering period is past. But certain oils appear to be the result of metabolic changes which are not necessarily connected with reproductive processes. Thus the essential oil of almonds is a product of the decomposition of amygdalin under the influence of the ferment emulsin. Oil of mustard is similarly produced from a specific glucoside by the agency of myrosin.

The whole subject has hardly received that attention from plant physiologists that its importance and interest demand. Experimentally it is confessedly most difficult, owing to the imperfection and restricted character of the analytical methods at the investigator's disposal, especially quantitatively; and it is, of course, accurate quantitative methods which are most needed in correlating the life-history of the plant with the occurrence and distribution of the fragrant oil.

The volume before us is the second edition of a work which made its first appearance in 1899, and it differs from its predecessor in several important particulars, partly in omissions, but more especially in extensions. Thus as regards the chemical nature of the essential oils, a comparison of the present volume with that of the first edition will serve to show the striking developments that have taken place in the interval. It is true that we have had no substantial addition to the main groups to which the various proximate principles occurring in essential oils may be referred, but the number of such substances has been greatly increased, and their physical characteristics, constitution and mutual relations have been far more accurately determined. The general survey of the chemistry of the subject given by Mr. Parry in the second chapter is as full as the limitations of space in a book not primarily intended for theoretical chemists would allow. The chapter on the preparation of the essential oils is, however, disappointing, especially in a work which professes to deal with the technology of the subject. The author practically contents himself with a statement of the principles of the main processes—expression, distillation and extraction—in general use, and omits all detail on the ground that details could not yield the practical man nearly so much information as could be obtained during a short stay in a factory. No doubt, in general, practice is worth more than precept, but if every technologist treated the practical aspects of his subject in this way technology would cease to exist.

By far the largest, and indeed the most valuable, section of the work is concerned with the systematic study of the more commercially important essential oils. This section constitutes about half the entire work. Great pains have evidently been taken in its compilation, and, so far as we have been able to discover, nothing of material importance relating to the origin, mode of manufacture and properties of any particular oil would appear to have been omitted. It need hardly be said that the well-known contributions which Messrs. Schimmel and Co. periodically make to the literature of the subject have afforded the author much of his information. Indeed, it must be admitted that the amount of actual original matter other than analytical data which he has been able to contribute to his work is not very extensive, and he has to depend upon others for the greater part of what he has to say relating to the origin and mode of extraction of the products he describes.

Since Tiemann's discovery of vanillin, which he first obtained from the glucoside coniferin more than a third of a century ago, a considerable number of so-called synthetic perfumes have been prepared, notably coumarin, heliotropin, ionone, artificial musk, and neroli. Vanillin, which is methyl protocatechuic aldehyde, is now obtained on a considerable scale from eugenol, the main constituent of oil of cloves, and also from guaiacol, as well as by other methods, and is largely used in confectionery. Costing as much as 160*l.* per lb. in 1876, it is now quoted at about 18*s.* Coumarin, originally discovered in the tonka bean, is found in a great number of plants, and was first synthetically obtained by Perkin. The synthetic product is now employed to a considerable extent in place of the tonka bean, as, for example, in the preparation of the well-known perfume *foin-coupé.*

Heliotropin is the methylene ether of protocatechuic aldehyde, and was first obtained from piperine, the active principle of pepper, and is now prepared from safrol. When first discovered its price, in 1880, was 70*l.* per lb.; it now costs about 8*s.* per lb.

Ionone, the artificial violet perfume, now largely employed in perfumery, was first obtained by Tiemann and Krüger in 1893. The preparation of these various substances artificially constitutes one of the triumphs of synthetic chemistry, and has given a great impetus to the manufacture of artificial perfumes. Practically all that has been up to the present made known on this subject is set out in detail in the last chapter of Mr.

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Parry's book. Incidentally the question of what is brandy is elucidated by what is stated respecting the nature of artificial cognac oil, which, however, strictly speaking, is not an essential oil. There is, as the author says, an almost unlimited field of research in the synthetic production of perfumes. The field is still practically untilled, and a rich harvest awaits the successful cultivator.

It is, however, a moot point whether any individual synthetic perfume is the equal, from the perfumer's point of view, of the corresponding natural perfume. Some of these synthetic perfumes in the pure or concentrated state in no wise resemble the natural variety; in fact, in this state they are almost repellent, and it is only when judiciously blended and diluted that their fragrance becomes pleasurable.

The fragrance of a natural perfume is in all probability not wholly due to a single substance or a single stimulus. Some one substance may be there in relatively large proportion, but associated with it are other odoriferous substances, some of them, possibly, in minute amounts only, but all of them contributing to an olfactory sensation which gives pleasure. A perfume, in fact, is like a piece of music. There may be in the piece a dominant musical idea, but the pleasure it creates is largely dependent upon its association with tone-sensations which are not necessarily structural parts of the dominant idea. Synthetic perfumes, therefore, can only successfully replace natural perfumes when the greatest care and judgment are exercised in blending. This kind of blending rises to the level of a fine art. To be successful in its exercise the olfactory sense of the blender requires a training hardly less rigorous than that required by the auditory sense of the musician.

This work, with all its limitations, is still the most complete treatise on the subject in our language, and as such is indispensable to the pharmacist, the perfumer, as well as to the analytical chemist who may be concerned with the examination of a class of substances of varying character and peculiarly liable to sophistication.

A MONOGRAPH ON THE FROG.

Der Frosch. Monographien einheimischer Tiere. Band i. By Dr. F. Hempelmann. Pp. vi+201. (Leipzig: W. Klinkhardt, 1908.) Price 4.80 marks.

THIS monograph, the editor informs us, has arisen in connection with elementary biological teaching at Leipzig, and is intended to describe not only the habits, structure, and development of "the physiologist's domestic animal," but to form an introduction to physiology, psychology, the mechanics of development, classification, and distribution. It is in respect of its scope that this addition to the vast literature on the frog differs from its predecessors. At the same time it is written for beginners, and must be judged from its value as an introductory handbook to practical dissection and experiment.

We may say at once that taken as a whole it is a well-written and successful attempt to compress all that is important and well established concerning the frog into 200 pages. But that is far more than an elementary student can assimilate, and between what he is first to notice and what he will only notice after the primary difficulties are overcome there is no means of distinguishing.

We regret that no mention is made of Marshall's famous book, and also that figures taken from his works are borrowed merely from reproductions of them by other authors. This neglect of Marshall is, however, no isolated case of the omission of some of the most important English works on the frog, both educational and other. There is surely no more important work on the distribution and systematic aspect of Amphibia than Boulenger's "Tailless Batrachians," nor is there a more readable account of the various aspects of this very animal than that by Holmes, published some two years ago. Lister's classical researches on the pigmented cells are nowhere referred to, whilst a small and almost unknown compilation by St. John Mivart more than thirty years old is quoted.

The first section, that on anatomy, is based on Gaupp's well-known edition of Ecker's work. Histology begins on p. 6, and the student is plunged into a study of the structure of the integument before the terms "cell," "transverse section," and "gland" are made clear. The apparently inevitable and complicated nomenclature reaches its maximum in connection with the brain, where no fewer than four sets of terms are used for each region. The difficult and complicated question of how the heart distributes arterial and venous blood requires a fuller sketch of the heart itself than is given on p. 54; whilst the equally difficult problems of development, *e.g.* of what are meant by "pronephros" and "mesonephros," are scarcely alluded to. The writer does not seem to appreciate the difficulties of beginners in regard to these unfamiliar conceptions.

The second section—physiology—is much better done, and the general features of metabolism are clearly explained. Then follow sections on heat-production, colour-change, movements, and the elementary physiology of muscle and nerve, leading up to a discussion of psychology and the development of consciousness. Some account is given of the experimental side of development, in which, however, we miss any reference to Assheton's work on the growth of different regions; in fact, the phenomenon of growth does not appear to be treated anywhere in the book. The references to sex-determination (pp. 162–4) in our present ignorance are inconclusive, and might well have been omitted.

Lastly, we come to "Biologie" (it is difficult to see why this, the most interesting part of a treatise, is always put at the end by German writers) and classification. Here we must agree to differ from the author. The common brown grass frog has always been *Rana temporaria* to us, but to find it described as *Rana muta laurenti* is indeed a shock. There is really no good ground for this change. The tendency needlessly to upset well-established names is a most regrettable feature of systematists; but to introduce confusion without any right, explanation or apology into a book

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